manual, whose *raison d'être* is justified by its having reached a fourth edition. If our readers are "philosophers," they will not require an account of what logarithms are (see Mr. Glaisher's excellent description in the "Encyclopædia Britannica," vol. xiv.); if they are not, with Mr. Squeers we say, "Then I am sorry for you, for I sha'n't be able to explain them."

The tables, are in the main, five-figure tables, except that the logarithms of 1001 to 1100 are given to seven places, and in the case of the logarithms of numbers extend to the logarithm of 10000. The other tables are logarithms of sines and tangents to every minute of the quadrant, and Gauss's sum and difference logarithms. Besides, there are a capital introduction, tables of useful constants with their logarithms, and solutions, by trigonometrical tables, of quadratic and cubic ($x^3 \pm px \pm q = 0$) equations. There are no tables of natural sines and tangents. We have no hesitation in commending these tables to a still wider public than they have already reached. R. T.

Principles of Theoretical Chemistry. By Ira Remsen. (Philadelphia: H. C. Lea's Son and Co., 1883.)

UNFORTUNATELY for some years past we have been treated with an immense number of "books" on chemistry in England of a most mechanical type: books in which no reasoning theory is apparent. A dry epitome of facts in a most unpalatable shape, embellished here and there with formulæ of various kinds, graphic, symbolic, empiric, or glyptic, but in very rare cases any attempt at showing the learner, easily, how these ideas of chemical constitution, represented by formulæ, are clearly arrived at. If a student is unable to see, in his mind, how the formula H_2SO_4 represents *a* knowledge of the constitution of sulphuric acid, he had much better only know its percentage composition, as it may otherwise lead him wrongly.

From the style of the present work, and some others we have recently seen from the other side, our cousins are taking up chemistry in a more philosophic manner than ourselves. And it is easy to see whence this view comes. Considering that we own a Dalton it is strange that the development of chemical theories is so lightly treated in English text-books. Are English students so superficial or so under the domination of *Exams.* that a work like Kopp's "Entwickelung" is too much for them?

This very condensed little work, just over 200 pages, is intended for somewhat advanced students who have a basement of facts to build upon. It commences with a general discussion of atoms and molecules, which is continued in a very simple and clear manner, with the exception of a few *newish* words like *chemism.* The chapters on atoms and molecules and on valency are about as clear and simple as they can be made, and the same may be said in regard to the opening chapter on carbon compounds. The author has evidently a reasonable notion of the value and permanence of a chemical theory, and no exception can be taken to the manner of discussion or expression. Speaking, for instance, of Avogadro's hypothesis, the author says: "It is at present almost universally accepted by chemists, some, indeed, going so far as to speak of it as a *law.*" It is certainly one of the best additions to the list of *small* chemical books that has been made for some time.

Studies in Micrographic Petrography. (Ady and Hensoldt, 7, Muchell Road, Nunhead, S.E.)

THE growing interest taken in this country in the study of petrography is well shown by the rapidly increasing facilities offered for the prosecution of this branch of science. The most recent of these has just appeared under the foregoing title. It is to consist of the issue of two dozen microscopic slides of characteristic minerals and rocks prepared by Mr. Hensoldt of Wetzlar, with illustrative drawings and descriptive text by Mr. J. E. Ady, who is already favourably known for his microscopic preparations of British rocks. The first number of the "Studies" is devoted to "*Eozoon*, Led Beg, Sutherland." It contains two lithographic plates illustrative of the so-called eozoonal structure of a limestone in the north of Scotland, and four pages of descriptive text. The author gives a brief reference to the literature of the subject, and an account of the microscopic structure of some portions of the limestone in question, which he regards as akin to that of the Canadian *Eozoon*, but as being of inorganic origin. We are afraid his sketch is too slight to have much weight in the controversy regarding *Eozoon.* His effort to extend the opportunities of petrographical investigation, however, and to popularise this fascinating but difficult branch of geology is praiseworthy, and we hope that his "Studies" may meet with such success as may induce him to continue them.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

The Remarkable Sunsets

THE numbers of NATURE for October, which are the latest to be seen here at this date, contain in the correspondence accounts of the green appearance of the sun in India. Some solar phenomena observable at present and during the whole of the past month are probably related to these, and yet are sufficiently distinct to deserve a separate description. They have, indeed, attracted the attention of everybody here by their novelty and spectacular magnificence, and to some have an ominous significance in connection with recent seismic disturbances.

In November and December we have in this part of Japan a remarkably clear atmosphere, and this year has proved no exception. The great snow-capped mountain, Fujii, some ninety miles away to the west, is beautifully defined to view both at sunrise and sunset on most days, although during the greater part of the year—the warmer part that is—it is rare to catch a glimpse of it.

The phenomena of which I wish to record a description occur every day before and after sunset and sunrise, and serve to materially lengthen our day. In this latitude, although not in the tropics, the shortness of the twilight is very noticeable as compared with that of England, but at present at least an hour and a half elapses between the moment of sunset and that of the disappearance of the last of its rays, and this, with the same time between dawn and sunrise, causes our day to be very appreciably lengthened.

On some days there is round the sun, even while it is still high, a considerable area of silvery glare, 40° to 50° in diameter, and bordered by a lurid reddish-brown or purplish-brown halo. A similar lurid turbidity lies in the horizon, and as the sun descends the halo blends with this below, while above the sun it attenuates and disappears, the silvery glare remaining undiminished. When the sun sets there is still a nearly circular area of this intense glare with a diameter of about 12°. On other days there is before sunset only a thin silvery light round the sun diffusing away from it, and only about and after the setting is the more defined area of strong light strikingly visible, and on these days the horizon also shows little of the dull redness mentioned above. Besides the above peculiarities, the sun preserves its whiteness much more than usual, so as to be only golden orange when setting.

Now follow the more remarkable phenomena. The white glare, or patch of silvery light, gradually sets, spreading out along the horizon as it does so, and passing through the sunset colours until little more than a red line one or two degrees deep remains. This happens at about twenty minutes after sunset. At this moment, on the gray curtain of twilight appears a white luminosity, which rapidly intensifies over the sunset, and shades away over almost half the visible hemisphere. The brightnes

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over the sunset becomes vividly brilliant, and at the same time delicately coloured. Over a somewhat depressed circular area, about 12° high and 15° broad, it assumes a pale green tint. Above this comes an equally dazzling pale yellow-orange, and again above this a soft rose colour melts away to the zenith. The revival of the light, or return from commencing twilight, is peculiarly striking. Buildings become brilliantly illuminated, and strong shadows are cast. All this outglow occurs in no more than five minutes, and now continues for about a quarter of an hour, but the brilliancy gradually contracts in area and sets with a magnificent display of sunset colours reaching some 120° round the horizon, until, by fifty minutes after sunset, this light has also gone down to a red line of about 2° elevation. I should not have omitted to say that the green light passes to yellow.

By this time night has fairly well come in the eastern half of the heavens, but already another but more delicate silvery whitening begins to show itself on the western curtain, and this also diffuses very rapidly up to the zenith and round to north and south. It also then goes through a process of contracting, intensifying to considerable brightness, and gradually passing through the sunset colours. Night is now full—with or without moonlight, according to date—and from the west, or rather from a point well to the north of it, spreads a delicate but brilliant light, having an almost perfect resemblance to the burning of a vast distant city. The last crimson light of this reflection does not disappear till an hour and a half after sunset.

The phenomena I have attempted to describe cannot possibly, I think, be explained otherwise than as being the effects of reflection, and that from a canopy many miles above the earth's surface. The matter of this canopy is highly transparent, for not only are moon and stars brilliantly clear, but in the crescent moon the dark surface of its sphere was on some nights in both months visible and so distinct as to have been noticed independently by several persons. (It has been suggested that this greater visibility of the dark surface of the moon may be due to a stronger reflection from the present atmosphere of the earth.) The reflecting matter must, I suppose be water, but in what form and under what conditions it is there so high up day after day in varying weather, it is difficult to me to conceive. We have had wet days intervening, cloudy days, and very windy days, but on all occasions, except during rain, the phenomena have been visible with strange uniformity.

Not counting the setting of the silvery glare twenty minutes after sunset, which ought perhaps to be done, there are, it will be seen, two reflected sunsets following the true one. In the morning before sunrise the same phenomena in inverse order are perhaps still more remarkable to see. Indeed the whole phenomena, night and morning, have a most unnatural and magical appearance, very different from those of the ordinary sunset and sunrise.

One other phenomenon, also of reflection, has yet to be mentioned. Rarely with much distinctness, but always to be noticed, there appears high up in the *east*, just after the silvery glare following the sun has set, and lasting only a few minutes, a dim image of the white glare and the western horizon just after sunset. It is of a delicate rosy light, with a grayish central part.

I am informed that somewhat similar appearances are being seen in Shan hai. EDWARD DIVERS

Imperial Japanese College of Engineering, Tokio,
December 12, 1883

IF the red sunsets are to be attributed to smoke and dust in the atmosphere from volcanic eruptions, as seems likely from the contributions in the last number of NATURE at hand (December 20), then it becomes important to take into account other eruptions which may have happened simultaneously with or since that of Krakatoa on August 27, 1883. In any discussion of atmospheric currents as fixing the dates of the appearance of these sunset phenomena at different places this is of special importance, in order that no confusion may arise in trying to reconcile places and dates that may refer to dust and ashes brought from entirely distinct eruptions. For this reason I send you the following extracts.

The first is from the U.S. Signal Service *Monthly Weather Review* for October, 1883, and is as follows:—

"*Unalaska, Alaska, October* 22, 1883

"*Executive Officer, Signal Service, U.S.A., Washington, D.C.*

"SIR,—I forward by this mail a sample bottle of sand that fell during the storm of October 20, 1883.

"At 2.30 p.m. the air became suddenly darkened like night, and soon after a shower of mixed sand and water fell for about ten minutes, covering the ground with a thin layer. The windows were so covered that it was impossible to see through them.

"This sand is supposed to have come either from the Menkushin or the new volcano adjacent to Bogoslov. The former is at a distance of about nineteen miles south-west, but for years has only issued forth smoke or steam. The latter is a new one, which made its appearance this summer, and burst out from the bottom of Behring Sea. It has been exceedingly active, as it has already formed an island from 800 to 1200 feet high.

"According to the report of Capt. Anderson, the discoverer, who sails one of the company's vessels, and who went within 2000 yards of it, it presents a most magnificent sight. The fire, smoke, and lava are coming out at many crevices, even under the water line. Large boulders are shot high in the air, which, striking the water, send forth steam and a hissing sound.

"Bogoslov is about sixty miles from here, in a westerly direction. The new volcano is about one-eighth of a mile north-west of it. "I am, Sir, very respectfully,
"S. APPLEGATE,
"Sergt. Sig. Corps, U.S.A."

The other extract is from a recent paper as follows:—

"*San Francisco, Cal., December* 28, 1883

"Prof. Davidson received from Alaska to-day the particulars of the volcanic disturbances there in October last, near the entrance to Cook's Inlet. On the morning of October 6 a settlement of fishermen on English Bay heard a heavy report, and, looking in the direction from whence the sound came, immense volumes of smoke and flame were seen to burst forth from the summit of Mount Augustine. The sky became obscured, and a few hours later great quantities of pumice dust began to fall, some of it being fine and smooth, and some gritty. At half-past three o'clock on the same day an earthquake wave thirty feet high came rushing in over the hamlet, sweeping away all the boats and deluging the houses. The tide at the time being low saved the settlement from utter destruction. This wave was followed by two other waves eighteen feet high, which were succeeded at irregular intervals by others. The pumice ashes fell to a depth of five inches, making the day so dark that lamps had to be lit. At night the surrounding country was illuminated by flames from the crater. Ordinarily Mount Augustine is covered with snow, but this year it is completely bare. Upon examination after the disturbances had subsided, it was found that the mountain had been split in two from base to summit, and that the northern slope had fallen to the level of the surrounding cliffs. Simultaneously with the eruption, a new island made its appearance in the passage between Chernaboura Island and the mainland. It was seventy-five feet high, and a mile and a half long. So violent was the volcanic action that two extinct volcanoes of the Peninsula of Alaska, lying to the westward of the active volcano Iliamua, 12,000 feet high, burst into activity, and emitted immense quantities of smoke and dust. Flames were visible at night. It is stated that the wives of a party of Aleut Indians, who were engaged in otter-hunting in that locality, became afraid of the subterranean noises, and refused to stay, returning to their homes. None of those who remained can be found."

The approximate positions of some of the points mentioned in these reports are as follows:—

	Lat.		Long.
Iliamua...	60·1 N.	...	153°·1 W.
Mount Augustine...	59·5 N.	...	153·5 W.
Unalaska	53·9 N.	...	166·5 W.
Bogoslov	54·0 N.	...	168·0 W.

Here we have the record of (1) a new volcano which appeared near Bogoslov some time during the summer, and had been continuously active and thrown up an island 1000 feet high up to some time in October; (2) an explosive eruption of Mount Augustine on October 6, which split off the whole side of the volcano and distributed ashes to a depth of five inches many miles away, and started a wave in the ocean about thirty feet high; and (3) of a shower of sand and water on October 20 at Unalaska, which probably arose from some fresh or renewed eruption of a neighbouring volcano.

Many of these phenomena resemble those reported from Krakatoa, though on a smaller scale. It is not necessary to point out that a continuous eruption of a new volcano for weeks

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